Clustering Algorithm for Showers

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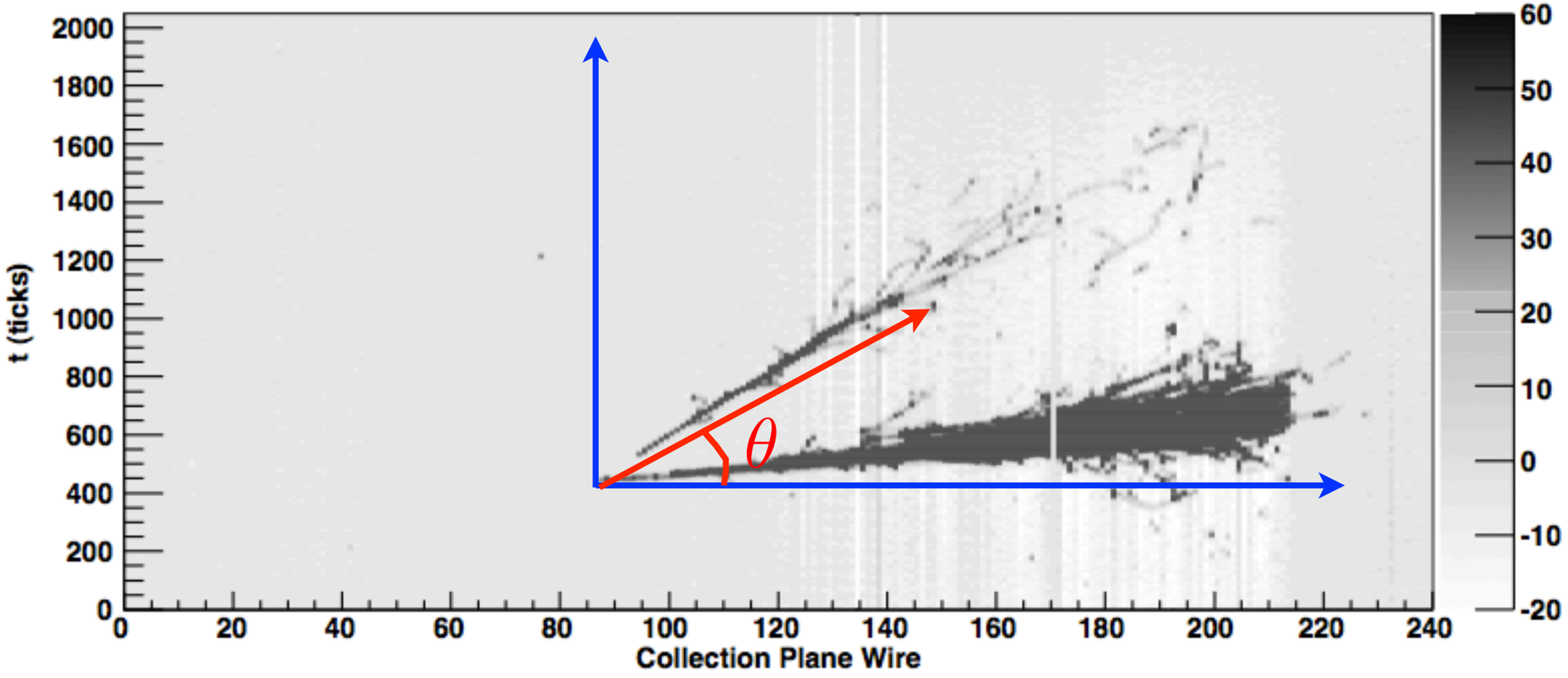
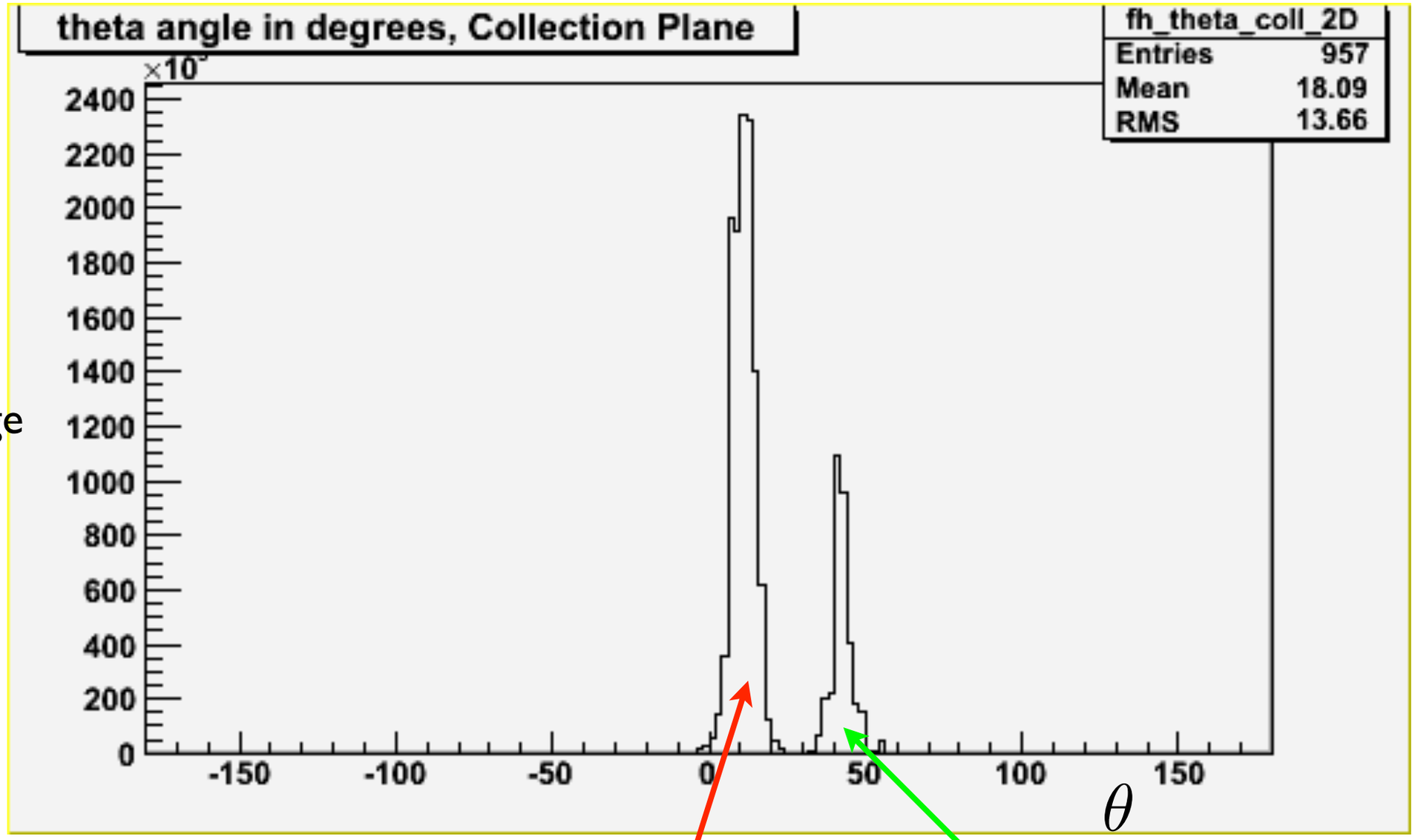
03/22/11

The main Idea behind the new algorithm

Perform angular distribution of
DBSCAN's hits
-- Need to know vertex





Charge

Cluster #1 Cluster #2

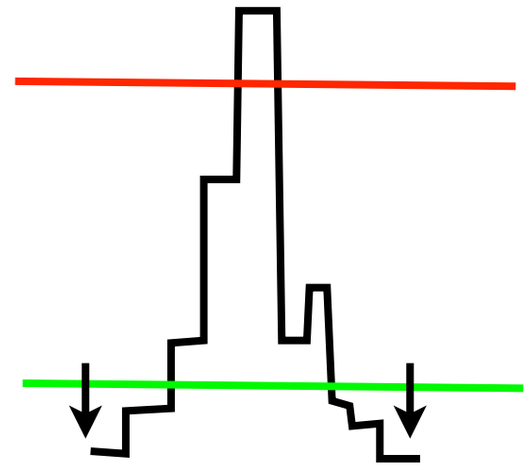
Assign the hits that fall within each peak to a cluster

More about the algorithm

- Requires 2 parameters:

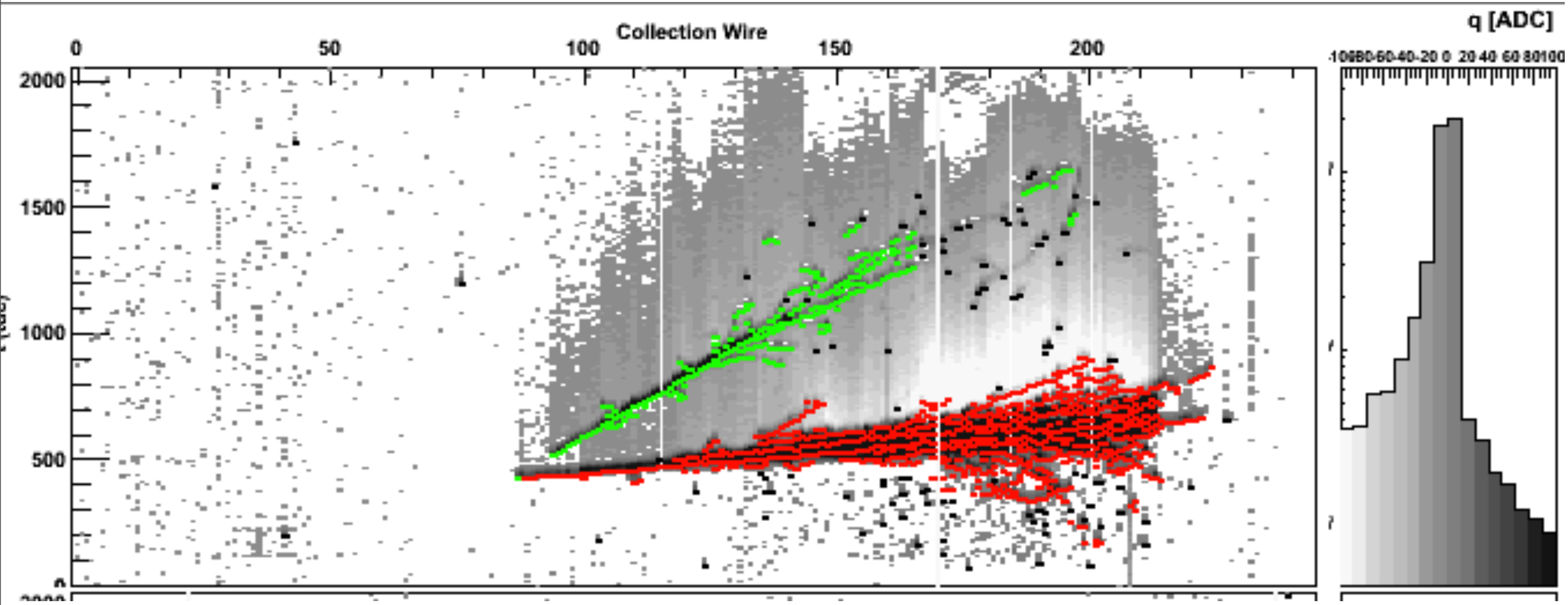
  1) minimum peak's height to be classified as a cluster

  2) min value of a start/end point of a peak

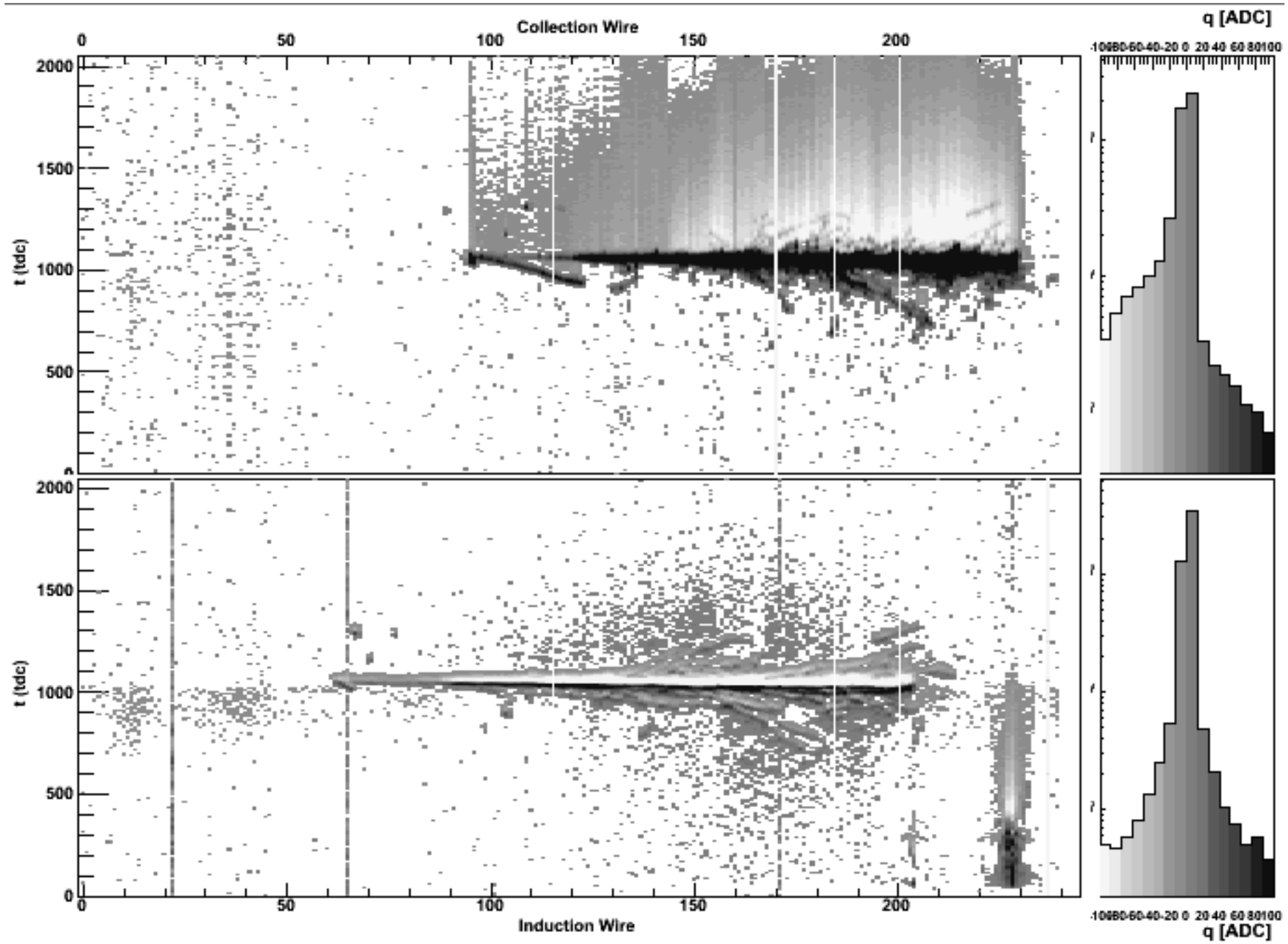


- Requires Vertex & DBSCAN
- --> DBSCAN assures that all the hits found by it will be clustered so there is no additional noise hits introduced by this algorithm

The Algorithm's result:



Another event from our data



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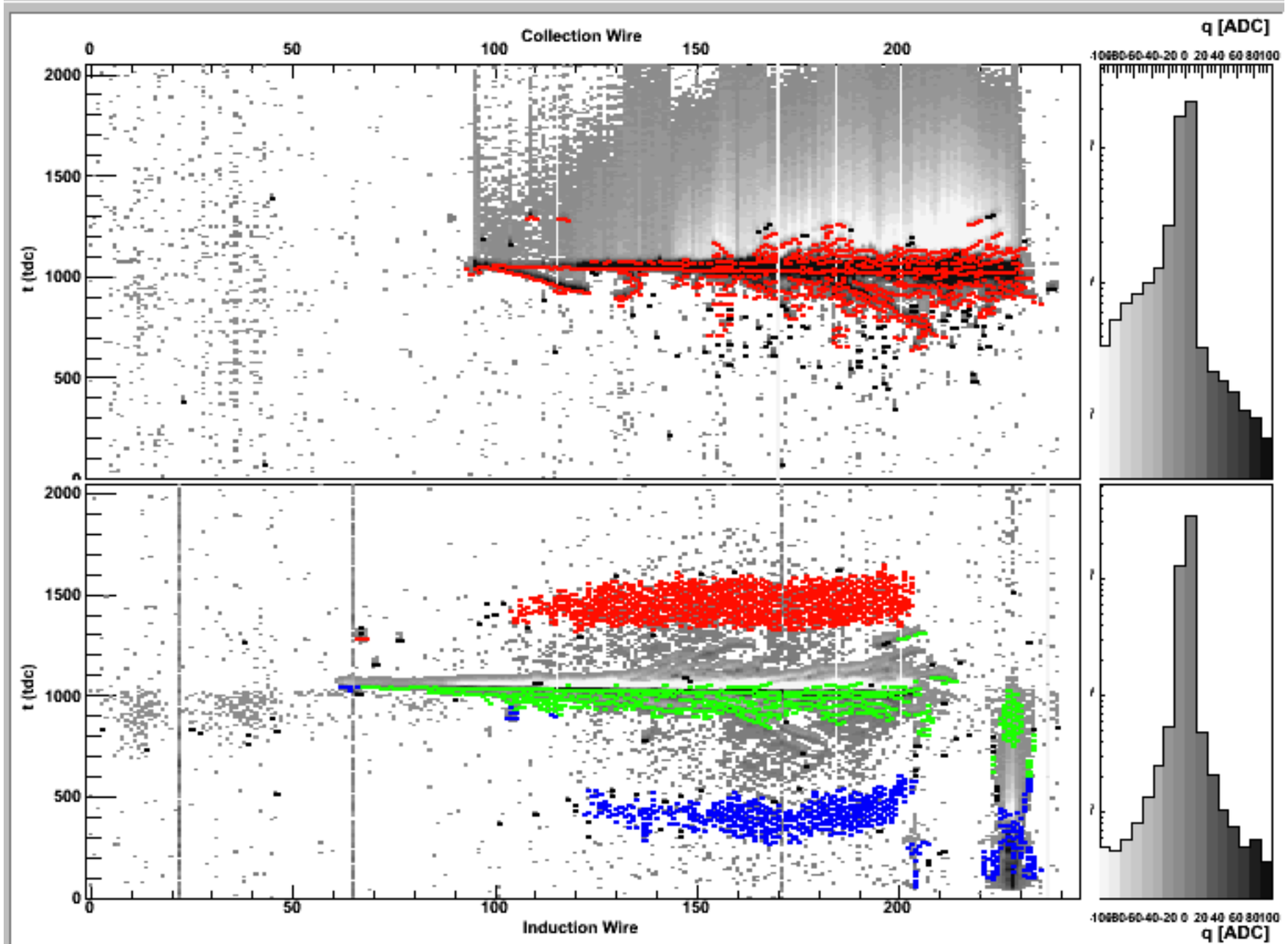


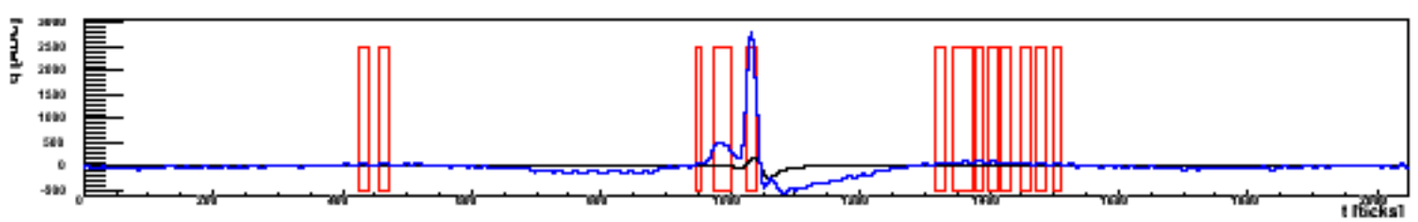
LArSoft

Run: 622/1

Event: 2738

UTC Fri Sep 18, 2009

16:16:45.000000000



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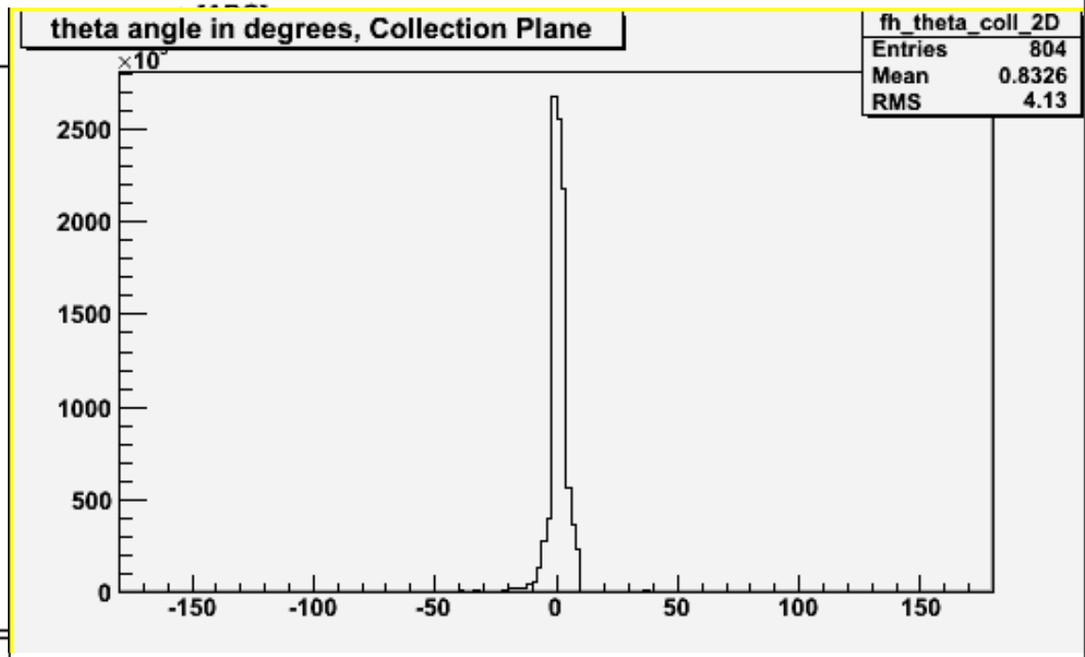
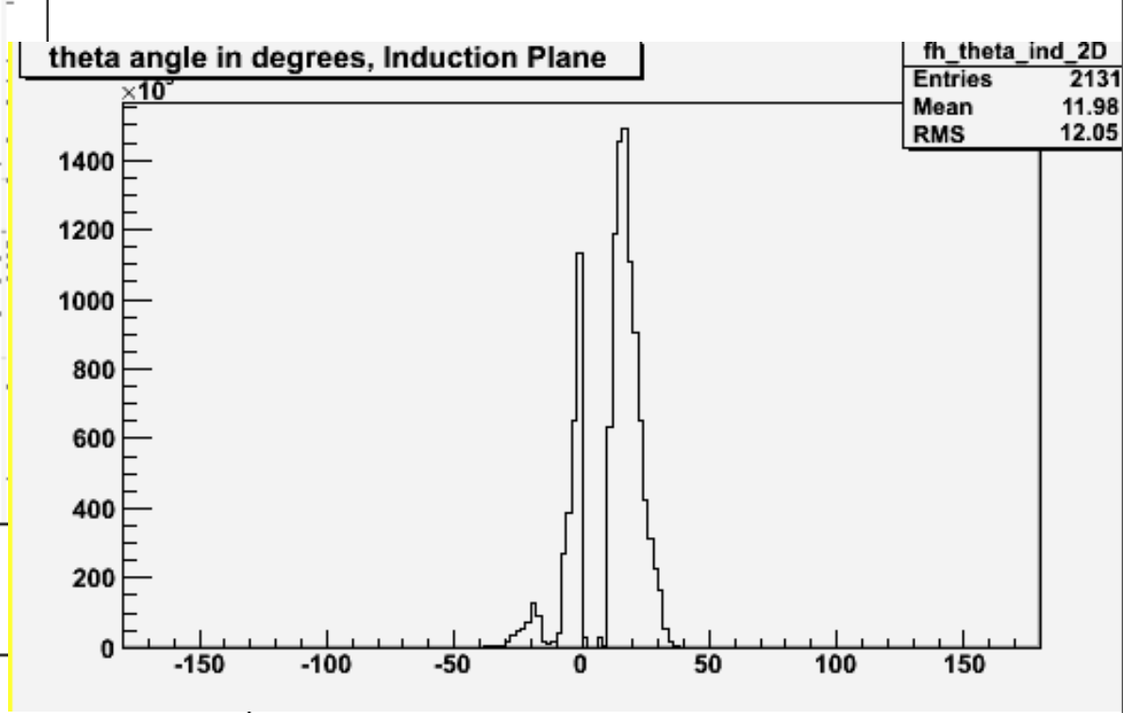
Collection Wire

t (tdc)

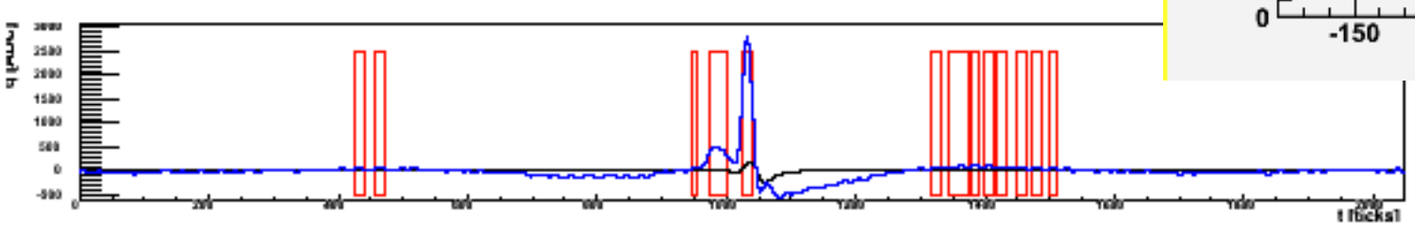
Induction Wire

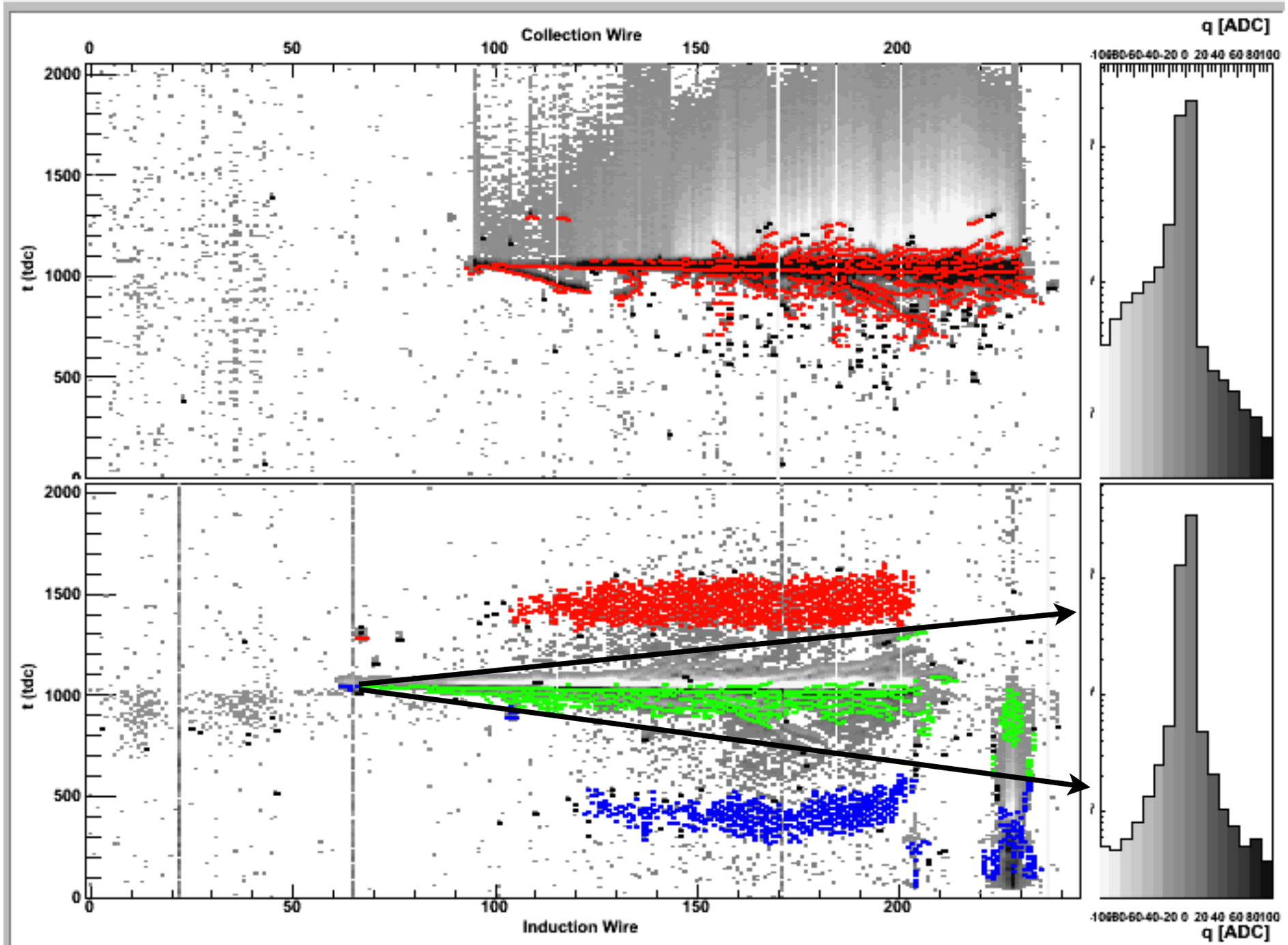
Fake Clouds of Hits

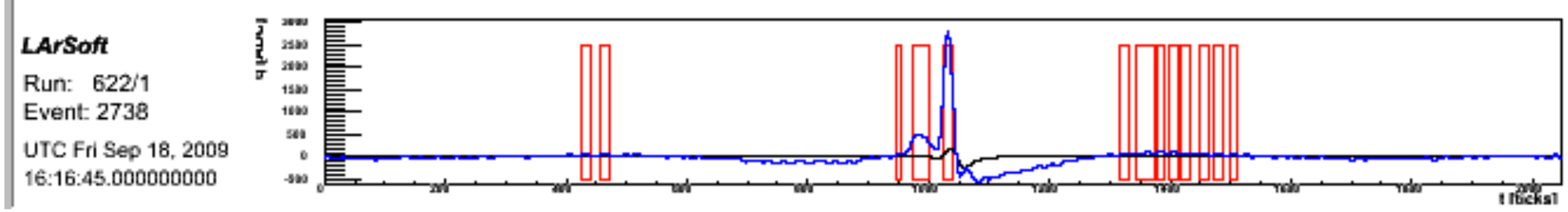




LArSoft
Run: 622/1
Event: 2738
UTC Fri Sep 18, 2009
16:16:45.000000000







LArSoft

Run: 622/1
Event: 2738

UTC Fri Sep 18, 2009
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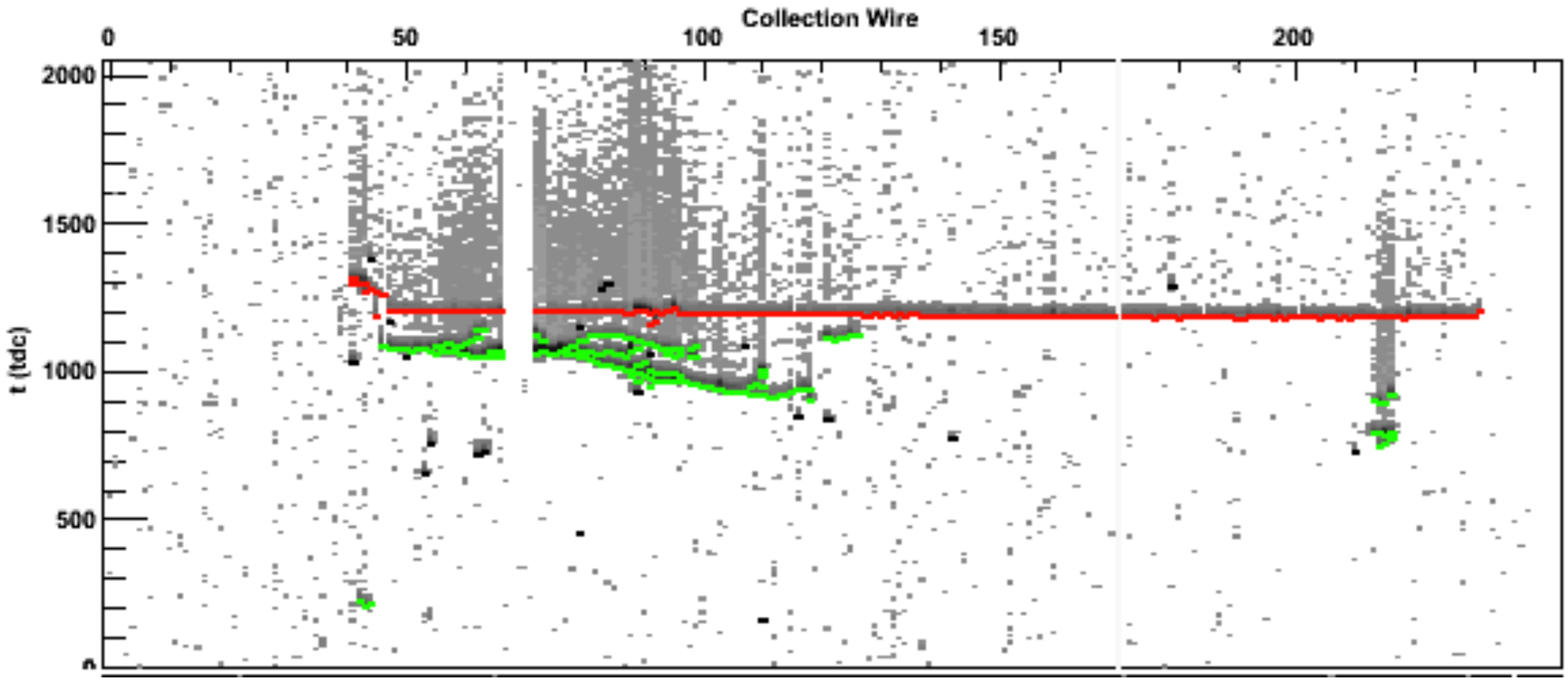
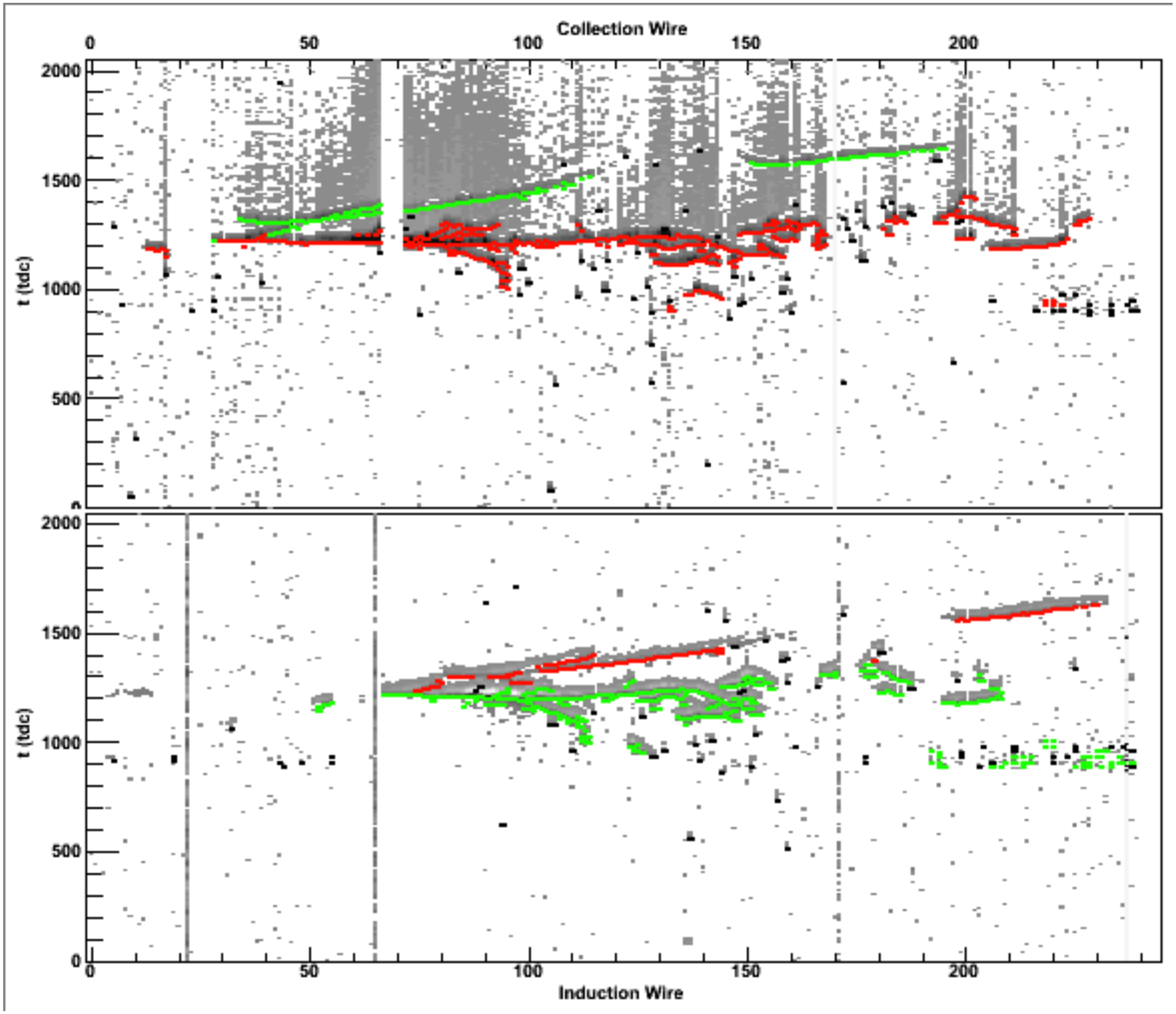
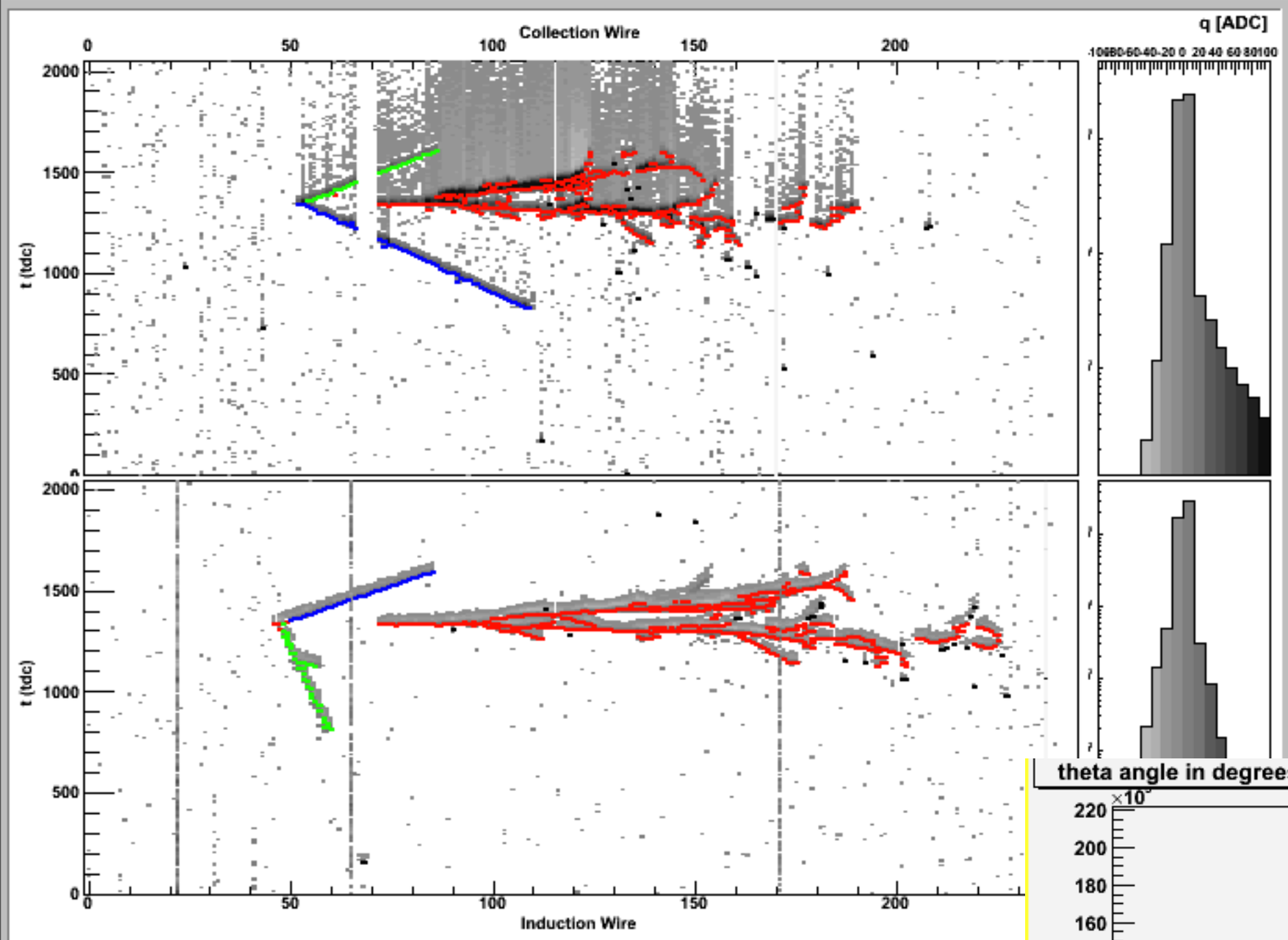
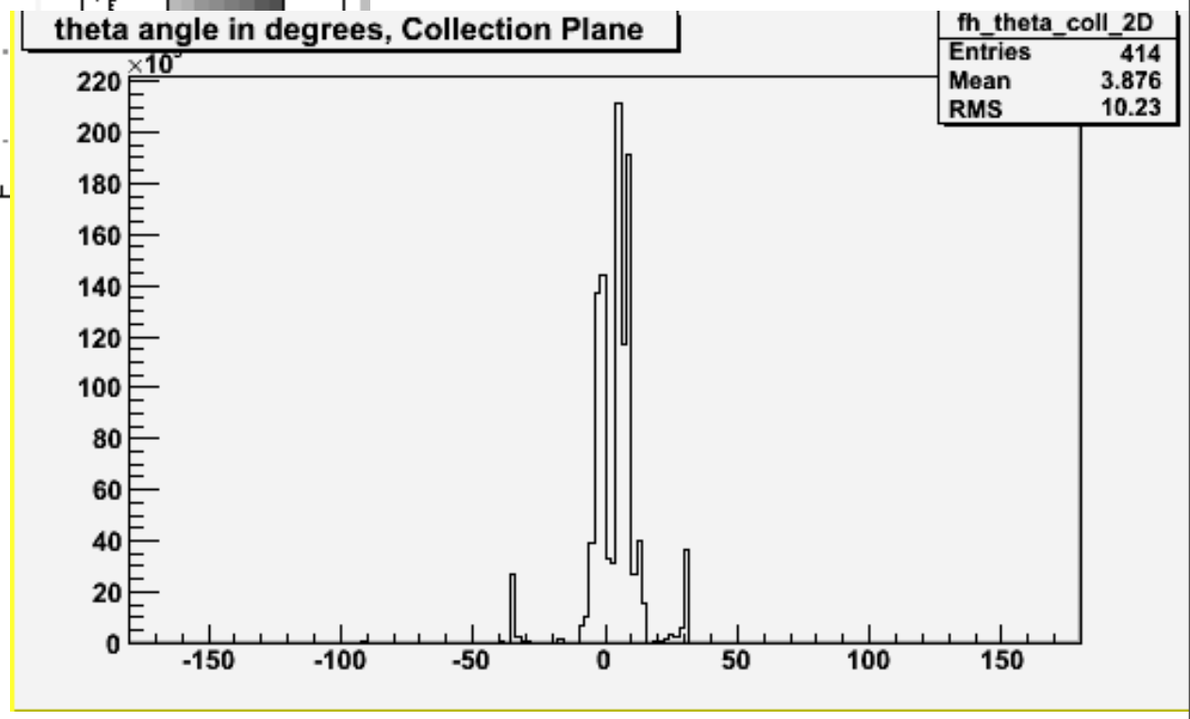
Another event from our data




Collection Wire
0
50
100
150
200
2000
1500
1000
500
0
t (tdc)
Induction Wire


Collection Wire
0
50
100
150
200
t (tdc)
2000
1500
1000
500
0
Induction Wire

q [ADC]


theta angle in degrees, Collection Plane
fh_theta_coll_2D
Entries 414
Mean 3.876
RMS 10.23
×10
220
200
180
160
140
120
100
80
60
40
20
0
-150
-100
-50
0
50
100
150

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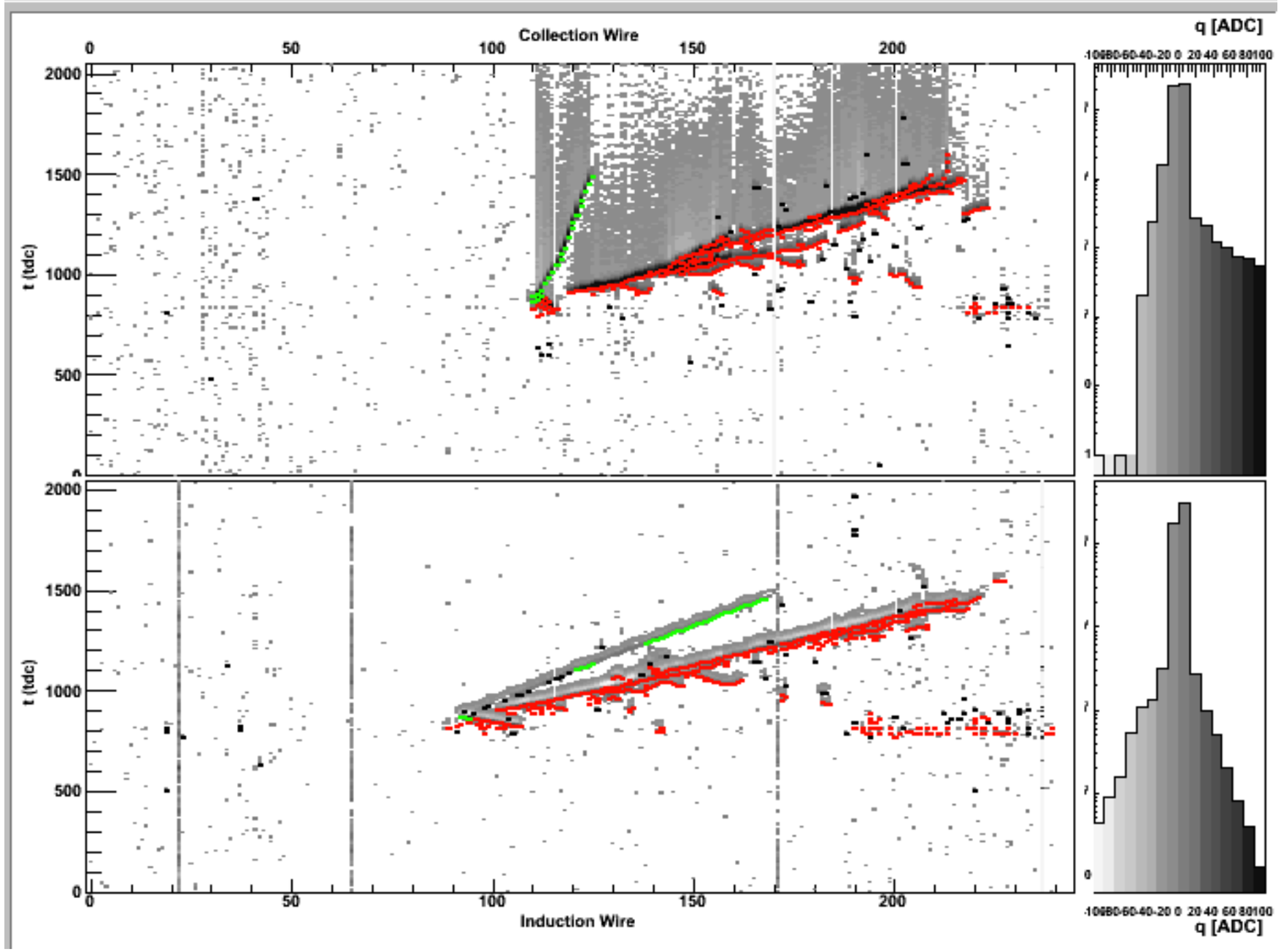

Conclusions

- This algorithm is at the early stage of development but the current results look promising for 2D shower clustering (and beyond ?)
- Future: pass it to ShowerFinder code to perform direction and energy reconstruction